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**Space Weather Technical Forecast**

Issued on Sunday, 07 April 2024 at 13:19 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

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**Space Weather Forecast Headline: No significant activity expected.**

**Analysis of Space Weather Activity over past 24 hours.**

**Solar Activity:** Very Low with only background flares observed. There are six sunspot regions on the visible disc, one of which is large but stable, the remainder are all relatively small with only limited development occurring.

No Earth-directed CMEs have been observed.

**Solar Wind / Geomagnetic Activity:** Solar wind was slightly enhanced due to a combination of the receding fast wind of CH16/- coupled with a likely weak passing transient. Observed speeds by DSCOVR were slightly elevated at 450-500km/s, falling to 410 km/s by the end of the period. The density was around average initially, gradually falling below average. Total Interplanetary Magnetic Field (IMF) strength, Bt, was Weak, below 7nT, the north-south component, Bz, was Weak, fluctuating between +5/-5nT. Phi angle was mainly negative (towards the Sun). Geomagnetic activity was Quiet (Kp 1-2).

**Energetic Particles / Solar Radiation:** High energy proton flux (greater than 10MeV) observed at GOES-18 was at background. High energy electron flux (greater than 2MeV) observed at GOES-16 was Background to Moderate, peaking 315 pfu at 06/1625 UTC. The associated 24-hour fluence remained well below the Active ( $1e8$  integrated flux) threshold, with a value of  $6.47e6$  integrated pfu at 07/0000UTC.

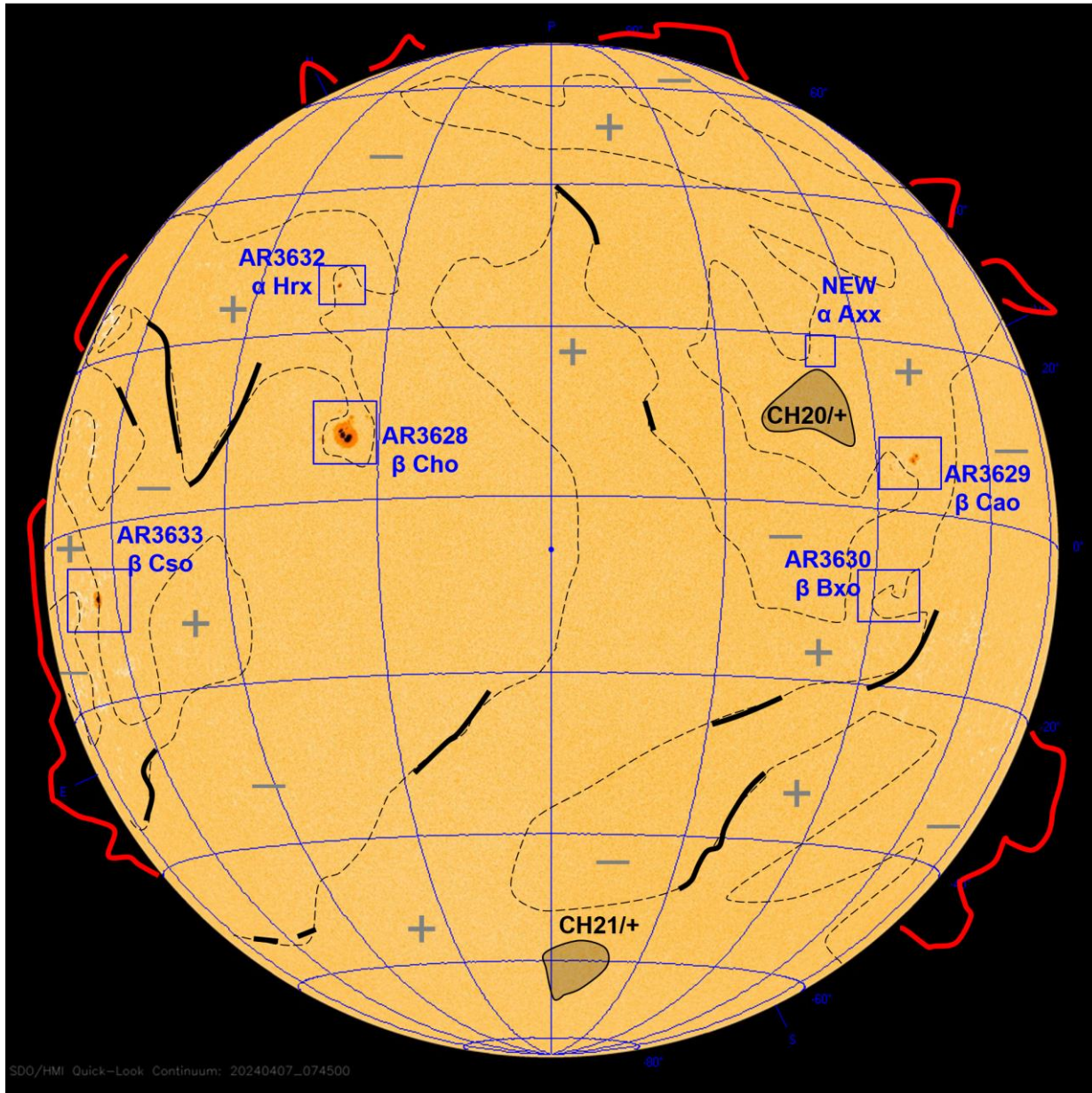
**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Low to Very Low activity is expected through the period, with a slight chance of rising to Moderate with isolated M-class flares. This risk likely increasing a little through the period.

**Solar Wind / Geomagnetic Activity:** There are no Earth-directed CMEs. Solar wind speeds are slightly elevated at between 400-430km/s, from the waning fast wind enhancement and recent weak transient, with a declining trend likely day 1-2 (07-08 Apr). The next enhancement is coronal hole 20, this most probably connecting later day 2, with ongoing effects on day 3 (08-09 Apr). Geomagnetic activity is forecast to be mainly Quiet with Unsettled intervals, but increasing to Unsettled with Active intervals day 2-3 with any fast wind enhancement.

**Energetic Particles / Solar Radiation:** High energy proton flux as observed by GOES-18, is expected to persist at background. High energy electron flux at GOES-16 is expected to continue at Background to Moderate day 1-2, but likely easing towards more persistent background day 3, after the fast wind arrival from CH20. The associated 24 hr electron fluence is expected to remain below Active.

Figure 1. Solar Analysis Valid 07/0800 UTC.



**Key:** Filament — , Prominence — , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson  $\alpha$ - $\beta$ - $\beta\gamma$ - $\beta\gamma\delta$  and Zurich-McIntosh Axx etc.

## Geomagnetic Storms:

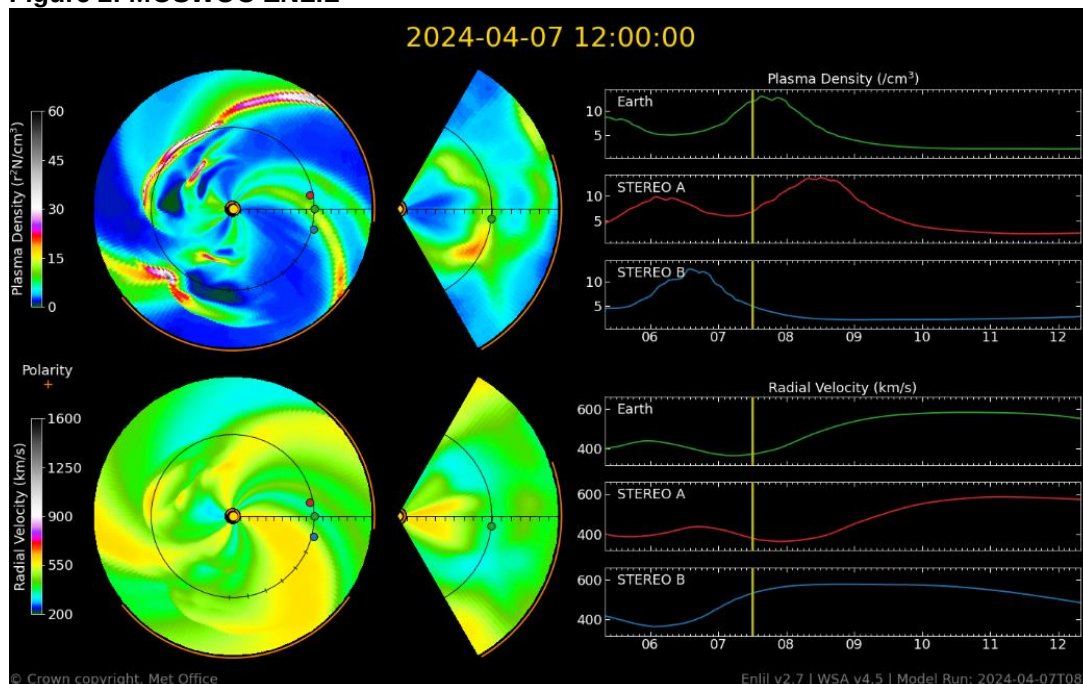
No Earth-directed CMEs.

Solar wind speeds are slightly elevated at between 400-430km/s, as weak transient influence and fast wind enhancements ease. The next enhancement will be the arrival of the fast wind CH20/+, in the northwest, most probably connecting later on day 2 (08 Apr). This is a weak, recently developed feature with the strength and timing of any connection currently low confidence. Current MOSWOC Enlil expectations are considered likely overdone, with peak winds most likely around 450-500 km/s. Any associated fast wind will likely ease later day 3 and day 4 (09-10 Apr)

Mainly Quiet geomagnetic activity is expected, with a slight chance of Unsettled intervals, but with a spell of Unsettled to Active intervals possible with the onset of any coronal hole fast wind day 2, perhaps continuing into day 3 (08-09 Apr).

| Geo-Magnetic Storm          | Level    | Past 24 Hours<br>(Yes/No) | Day 1<br>(00-24 UTC) | Day 2<br>(00-24 UTC) | Day 3<br>(00-24 UTC) | Day 4<br>(00-24 UTC) |
|-----------------------------|----------|---------------------------|----------------------|----------------------|----------------------|----------------------|
| Probability<br>(Exceedance) |          |                           | (%)                  | (%)                  | (%)                  | (%)                  |
| Minor or Moderate           | G1 to G2 | No                        | 1                    | 5                    | 5                    | 1                    |
| Strong                      | G3       | No                        | 1                    | 1                    | 1                    | 1                    |
| Severe                      | G4       | No                        | 1                    | 1                    | 1                    | 1                    |
| Extreme                     | G5       | No                        | 1                    | 1                    | 1                    | 1                    |

Figure 2: MOSWOC ENLIL



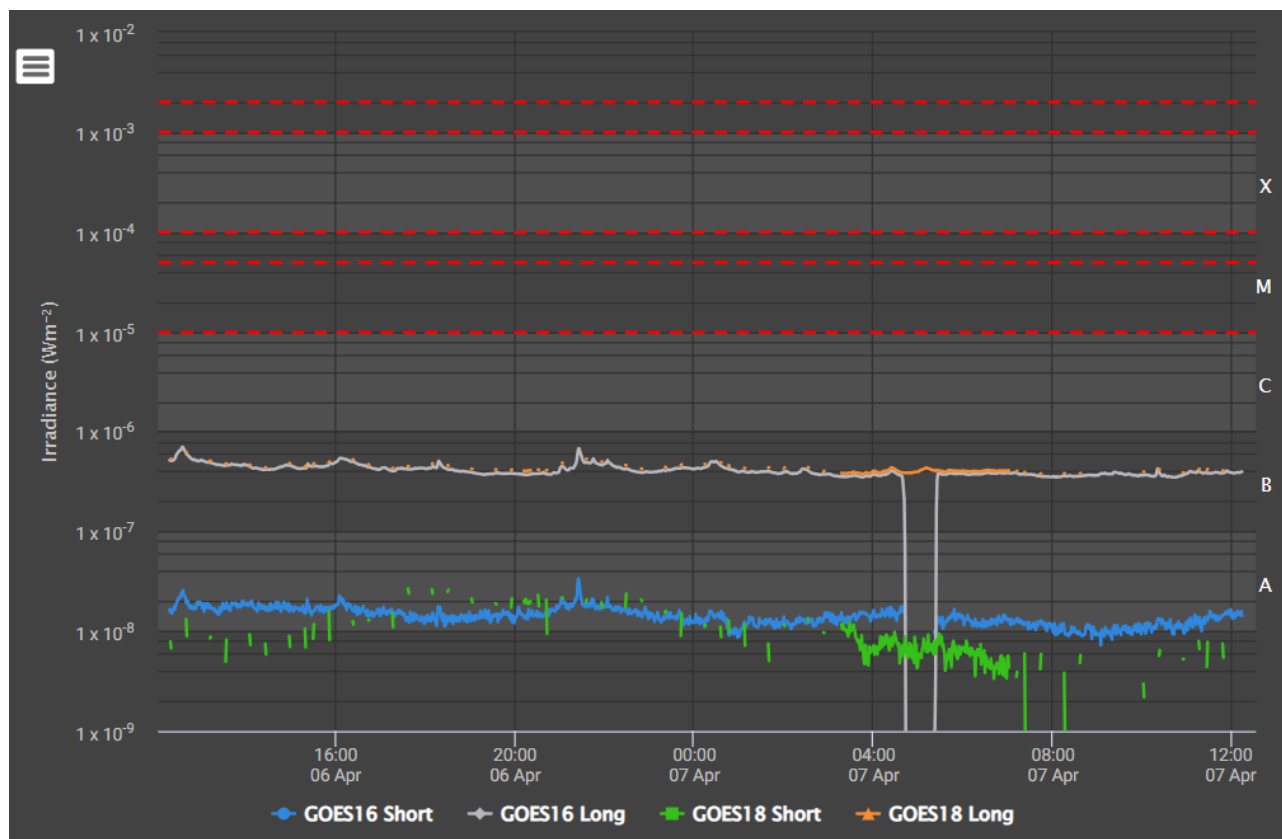
## Radio Blackouts - X-Ray Flares:

Low activity is expected, with a likelihood of C-flares and a slight chance of isolated M-class flares.

There are six sunspot regions on the visible disc, all of which are relatively small with only limited development occurring. AR3633 is set within relatively bright plage near the southeast limb, but remains a simple bipolar spot. AR3628 remains stable despite the development of a small negative leader spot. While the east limb also has a number of other bright flux sources on SDO imagery, these are mostly showing themselves as plage regions as they rotate on, however there remains the potential for further spots to become apparent.

| X Ray Flares | Level            | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------|------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability  |                  |                        | (%)               | (%)               | (%)               | (%)               |
| Active       | R1-R2 M Class    | No                     | 10                | 15                | 20                | 20                |
| Very Active  | R3 to R5 X Class | No                     | 1                 | 1                 | 1                 | 1                 |

Figure 3: 24 hour X-Ray Trace.



## Solar Radiation Storms - (High Energy Protons):

High energy proton flux as observed by GOES-18 is at background and expected to persist at this levels with none of the visible active regions bringing a risk of significant proton rich flares.

| Radiation Storms         | Level (cm <sup>-2</sup> sr <sup>-1</sup> s <sup>-1</sup> ) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|------------------------------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |                                                            |                        | (%)               | (%)               | (%)               | (%)               |
| Active                   | ≥ S1                                                       | No                     | 1                 | 1                 | 1                 | 1                 |
| Very Active              | ≥ S3 *                                                     | No                     | 1                 | 1                 | 1                 | 1                 |

\* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm<sup>-2</sup>sr<sup>-1</sup>s<sup>-1</sup>)

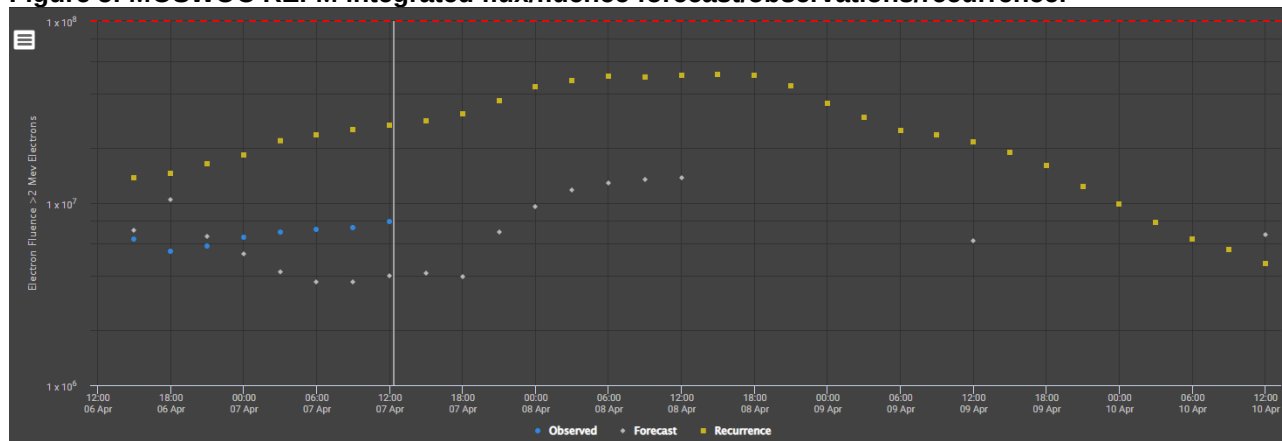
## High Energy Electrons Event (≥ 2MeV):

High energy electron flux observed by GOES-16 is likely to vary between Background and Moderate days 1-2 (07-08 Apr), before perhaps dropping to be more persistently Background day 3 (09 Apr) onward. This would be in response to the fast wind arrival from CH20. Only a minimal connection to this feature is expected however, with flux likely persisting at or near background thereafter.

The associated 24 hour electron fluence is expected to remain below the Active threshold, with REFM currently giving good guidance for expected conditions.

| GEO Electron Environment | Level (cm <sup>-2</sup> sr <sup>-1</sup> day <sup>-1</sup> ) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|--------------------------------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |                                                              |                        | (%)               | (%)               | (%)               | (%)               |
| Active                   | ≥ 2 MeV<br>≥ 1x10 <sup>8</sup>                               | No                     | 1                 | 1                 | 1                 | 1                 |
| Very Active              | ≥ 2 MeV<br>≥ 1x10 <sup>9</sup>                               | No                     | 1                 | 1                 | 1                 | 1                 |

**Figure 5: MOSWOC REFM integrated flux/fluence forecast/observations/recurrence.**



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